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Sire breed effects on economic efficiency of a terminal-cross beef production system

Abstract

This article was abstracted from a manuscript by Gerald H. Smith, U.S. Meat Animal Research Center, Clay Center, Nebraska which appeared in the December, 1976, issue of the Journal of Animal Science. The carcass and meats research data for the study were coordinated by Dr. Michael E. Dikeman, Kansas State University, so permission was granted to present results of that study here. Performance and carcass characteristics of the cattle were presented in the 1975 Cattlemen's Day Report.

Keywords

Report of progress (Kansas State University. Agricultural Experiment Station); 291; Cattlemen's Day, 1977; Beef; Terminal-cross; Performance; Carcass characteristics

Sire Breed Effects on Economic Efficiency of a Terminal-Cross Beef Production System

Gerald M. Smith and Michael E. Dikeman

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Summary

Economic efficiency was evaluated for a terminal-cross production system in which Hereford and Angus cows were bred to Hereford, Angus, Jersey, South Devon, Limousin, Charolais and Simmental bulls. The analyses included calving difficulty, pre-weaning survival, growth rate, feed efficiency, carcass composition and quality grade.

Ownership of the calves was assumed by the cow/calf man until the carcasses were fabricated into retail cuts. Sire breeds were compared for retail product cost, profit per calf and profit per cow. The comparisons were made separately by age-of-cow for three different slaughter end points: constant age (217 days on feed), constant weight (1035 lb.) and constant grade (5% ribeye fat).

Limousin, Charolais and Simmental crosses were generally favored for all cow ages, slaughter end points and evaluation criteria. South Devon and Hereford-Angus reciprocal crosses tended to have similar merit and ranked intermediate between straightbred Hereford and Angus and the Limousin, Charolais and Simmental crosses. Jersey crosses ranked lowest in all comparisons. Altering grain/forage and choice/good price ratios had little effect on the results. The apparent ability of cattle with increased growth rate, feed efficiency and carcass merit to offset large differences in cost per calf weaned suggested that calves from large, growthy breeds should warrant a market premium.

Introduction

Large, growthy sire breeds have focused attention on calving difficulty and the need to consider all segments of the production cycle when evaluating breeding systems. This study provides an economic evaluation of production efficiency for Hereford and Angus cows mated to seven sire breeds representing a wide range in calving difficulty, growth rate, feed efficiency and carcass composition.

Experimental Procedures

The approach of this study was to make assumptions necessary to quantify the cost of calves entering the feedlot, feedlot costs and carcass value. The primary data came from 2,368 calves born at the U. S. Meat Animal Research Center in 1970-72 as part of a germ plasm evaluation program. The calves were out of Hereford and Angus cows sired by Hereford, Angus, Jersey, South Devon, Limousin, Charolais and Simmental bulls. Postweaning growth, feed efficiency, carcass composition, quality and meat palatability data are from 1,105 steers.

Nonfeed Cow Costs. We used a fixed cost of $45 per cow bred. Labor costs were set at $20 plus $4 per difficult birth. Labor cost included artificial insemination plus 24-hr. surveillance during calving. Replacement costs were calculated under the assumption that all open cows were replaced each fall at palpation at a net cost of $100 per head ($300 replacement cost minus $200 salvage value). The replacement rate was 18% for cows experiencing no calving difficulty and 34% for cows with difficulty. A 2% death rate was assumed for all cows.

Cow Feed Costs. To estimate cow herd feed costs, feed requirements were estimated from book values. Cost of feed of sufficient quality to meet a cow's protein requirements was $.0122 per Mcal of ME ($.02 per lb. TDN). Reproduction and lactation requirements were assumed independent of the calf's sire breed.

Calf Costs. Pre-feedlot calf costs included preweaning feed consumption plus feed consumption and fixed costs during a 25-day conditioning period. Creep consumption for each sire breed by cow age was in proportion to TDN requirements not furnished by milk. The price of creep feed and feed during the 25-day conditioning period was equal to feedlot feed. A $10 per head fixed cost was added to each calf weaned.

Cost per Calf. Total cost per cow bred for each sire breed was divided by weaning percentage of that sire breed to estimate cow herd cost per calf weaned.

Feedlot Costs. Feed requirements for each breed group were measured and ration cost was set at $.0244 per Mcal of ME ($.04 per lb. of TDN).

Slaughter End Points. Three slaughter end points were evaluated: 217 days on feed (constant age), 1035 lb. (constant weight) and 5% ribeye fat (constant grade of low choice).

Evaluation Criteria. To fairly evaluate sire breeds that vary widely in size, growth rate and carcass composition, economic factors from cow herd through retail product were considered.

An Example. An example in table 30.1compares production of Hereford-Angus (HAx) and Charolais (Cx) crossbred calves from 2-year-old Hereford and Angus cows for the slaughter end point of 217 days on feed. Assumptions made for all costs were used in this example. Calving difficulty of 41% for HAx and 74% for Cx gave different labor and replacement charges. The slightly higher lactation feed charge for HAx reflects fewer early calf deaths (7.0 vs. 13.4%) and, hence, a higher percentage of lactating cows.

The different weaning percentages (89.9 for HAx and 74.0 for Cx) are reflected in the total cost per calf weaned.

A fixed charge of 25¢ per day was assumed to cover interest, feed mixing-handling, veterinary expenses and other nonfeed charges in the feedlot. Prices were set at $1.15/lb. for choice-grade retail product, $1.07 for good-grade retail product and $.02 for fat trim. Those prices roughly correspond to live cattle prices of $45 and $42 per 100 lb.

Results and Discussion

Retail product cost, profit per calf and profit per cow at three slaughter end points are given in table30.2 for each breed-group by cow-age. With only minor exceptions, Limousin (Lx), Charolais (Cx) and Simmental (Sx) crosses were favored for all cow ages, slaughter end points and evaluation criteria. South Devon (SDx) and HAx tended to have similar merit and to rank intermediate between straightbred H and A and the Lx, Cx and Sx. Jersey crosses (Jx) ranked lowest in all comparisons.

The different methods of evaluating had only minor impact on the results. Breed groups with good preweaning livability ranked relatively higher for profit per cow than for profit per calf. The larger, faster growing, leaner breed groups had an advantage for retail product cost at age- and weight-constant slaughter end points.

To examine the possible effects of different grain/forage price ratios, three feedlot ration costs were considered $.0183, $.0244 and $.0305 per Mcal of ME (or $.03, $.04 and $.05 per lb. of TDN). Profit per cow at a grade-constant end point for each feed cost is shown in figure 30.1 . The advantage of Lx, Cx and Sx changed little by those changes in feed costs.

Two values for choice-grade retail product ($1.15 and $1.20 per lb.) and one value for less than choice-grade retail product ($1.07/lb.) were used to examine possible effects of different choice-good price ratios. Figure 30.2 presents profit per cow by breed group when evaluated at the age-constant end point. Increased value of choice-grade retail product favors H&A, HAx, Jx and SDx because of their higher percentages in the choice grade. Nonetheless, for both prices used, Lx, Cx and Sx ranked highest for profit per cow.

The effect on profit per cow of three charges for costs per difficult birth for 2-year-old cows suggest that growth and carcass merit of Lx, Cx and Sx tend to offset substantial costs associated with their increased calving difficultly.

The evaluation of only one system of production limits interpretation of results. For instance, breed groups with a low frequency of calving difficulty may have been more profitable with less intensive management during the calving season. Also, this study assumed that replacement cows were available from outside the production system at a constant cost. Mating systems with younger cows used to produce purebred replacement heifers likely would be better.

In addition, one ownership of the calves was assumed to the point of carcass fabrication into retail cuts; in other words, a cow/calf producer who custom feeds his calves and sells on a grade-and-yield grade basis.

Cattle with increased growth rate, increased feed efficiency and increased carcass value have the ability to offset large differences in cost per calf weaned. Hence, sire breeds of large mature size, high growth rate, good feed efficiency and lean carcass composition apparently have much to offer in terminal-cross production systems.

Table 30.1. An Example Illustrating Key Assumptions[a].

Item		Breed group[a] HAx	Cx
I.	Cow Herd Costs (per cow bred)	$	$
	A. Nonfeed		
	1. Fixed (excluding labor and replacement)	45.00	45.00
	2. Labor (20 + 4D[c])	21.64	22.96
	3. Replacement 100(1-D)(.18) + 100(D)(.34) + 300(.02)	30.56	35.84
		97.20	103.80
	B. Feed		
	1. Maintenance and growth	45.37	45.37
	2. Lactation	17.80	15.91
	3. Pregnancy	7.20	7.20
		70.37	68.48
	Total per cow bred	167.57	172.28
	Total per calf weaned	186.39	232.81
II.	Calf Prefeedlot Costs		
	1. Creep feed	7.17	8.19
	2. Forage	8.31	9.53
	3. Preconditioning feed	7.48	7.24
	4. Per head costs	10.00	10.00
		32.96	34.96
	Total per calf weaned	219.35	267.77
	Total per calf entering feedlot (figures 2% deaths)	223.83	273.23
III.	Feedlot Costs (217 days on feed)		
	A. Fixed (25¢/day/hd)	54.25	54.25
	B. Feed	114.76	118.84
		169.01	173.09
	Total cost per slaughter animal	392.84	446.32
	Cost per lb. slaughter weight	0.40	0.42
	Cost per lb. retail product	1.03	0.98
	Sale value per calf	424.05	484.82
	Profit per calf	31.21	38.50
	Profit per cow	27.50	27.92

[a] Example is for calves from 2-year-old cows fed to an age-constant (217 days on feed) slaughter end point.

[b] HAX equals Hereford x Angus and reciprocal crosses; Cx equals Charolais x Hereford and Charolais x Angus crosses.

[c] D equals the percentage of calves born with difficulty.

Table 30.2. Breed Group by Cow Age Comparisons for Three Evaluation Criteria at Three End Points[a]

Breed Group	Cow Age	Retail product cost, $/lb.			Profit/calf, $			Profit/cow, $		
		217 days	1035 lb.	5%RE fat	217 days	1035 lb.	5%RE fat	217 days	1035 lb.	5%RE fat
HH + AA[b] (H + A)	2	1.06	1.10	1.05	14	13	26	12	11	22
	3	1.01	1.04	1.00	37	36	49	33	33	44
	4	1.01	1.03	.98	41	41	53	38	38	39
	5+	1.00	1.00	.96	53	53	64	49	49	60
	Avg[c]	1.01	1.03	.98	43	42	54	39	39	50
HA + AH (HAx)	2	1.03	1.05	1.02	31	34	35	28	30	31
	3	.99	.99	.97	55	56	57	52	53	54
	4	.98	.98	.96	60	60	61	59	58	59
	5+	.96	.96	.93	71	70	71	69	69	69
	Avg[c]	.98	.98	.96	61	61	62	58	59	59
JH + JA (Jx)	2	1.08	1.14	1.06	9	4	24	8	4	21
	3	1.08	1.12	1.04	15	11	30	14	10	27
	4	1.10	1.12	1.04	14	10	29	13	9	26
	5+	1.05	1.07	.99	32	29	47	30	27	45
	Avg[c]	1.06	1.09	1.01	23	20	38	22	18	36
SDH + SDA (SDx)	2	1.05	1.07	1.05	18	18	28	14	14	22
	3	.98	.98	.96	56	56	66	50	50	58
	4	.95	.93	.92	75	75	85	73	72	82
	5+	.96	.94	.92	72	72	82	64	64	73
	Avg[c]	.98	.96	.95	61	61	71	55	55	63
LH + LA (Lx)	2	.98	1.00	1.02	44	40	47	34	31	37
	3	.88	.89	.92	90	90	98	83	82	90
	4	.91	.90	.93	84	85	93	75	76	84
	5+	.88	.86	.89	100	101	111	94	96	105
	Avgc	.90	.89	.92	87	87	96	80	80	89
CH + CA (Cx)	2	1.00	1.00	1.00	39	38	59	28	27	43
	3	.90	.89	.90	90	86	109	78	74	94
	4	.90	.88	.89	96	91	114	86	81	101
	5+	.90	.87	.88	100	94	117	85	80	100
	Avg[c]	.92	.90	.91	88	83	106	75	70	90
SH + SA (Sx)	2	.99	.99	.98	46	46	64	38	39	54
	3	.95	.94	.94	73	68	87	62	58	74
	4	.93	.92	.92	83	76	95	73	67	84
	5+	.91	.89	.89	98	89	108	89	81	99
	Avg[c]	.93	.92	.92	84	77	96	74	69	86

[a] Evaluation made after 217 days on feed, at 1035 lb. live weight and at 5% ribeye (RE) fat.

[b] H = Hereford, A = Angus, J = Jersey, SD = South Devon, L = Limousin, C = Charolais and S = Simmental; HA = Hereford sire x Angus dam, etc.

[c] Weighted average: 16.8% 2-year-olds; 14.6% 3-year-olds; 13.0% 4-year-olds; 55.6% $\geq$ 5-year-olds.

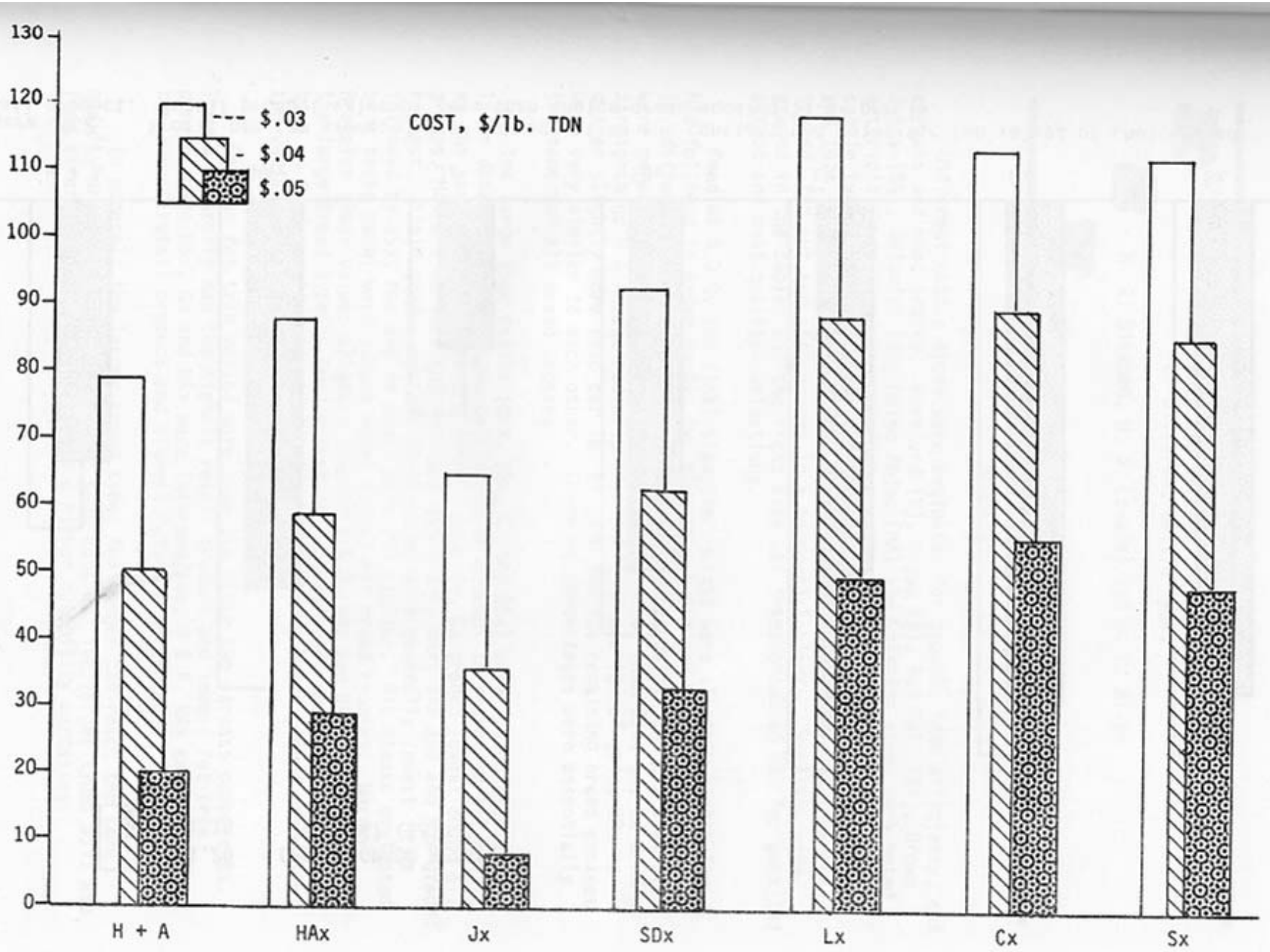

Figure 30.1. Profits per cow averaged across cow age at a grade-constant end point for three growing/finishing feed costs (per lb. of TDN). Feed cost for the cow herd equalled $.02/lb. TDN.

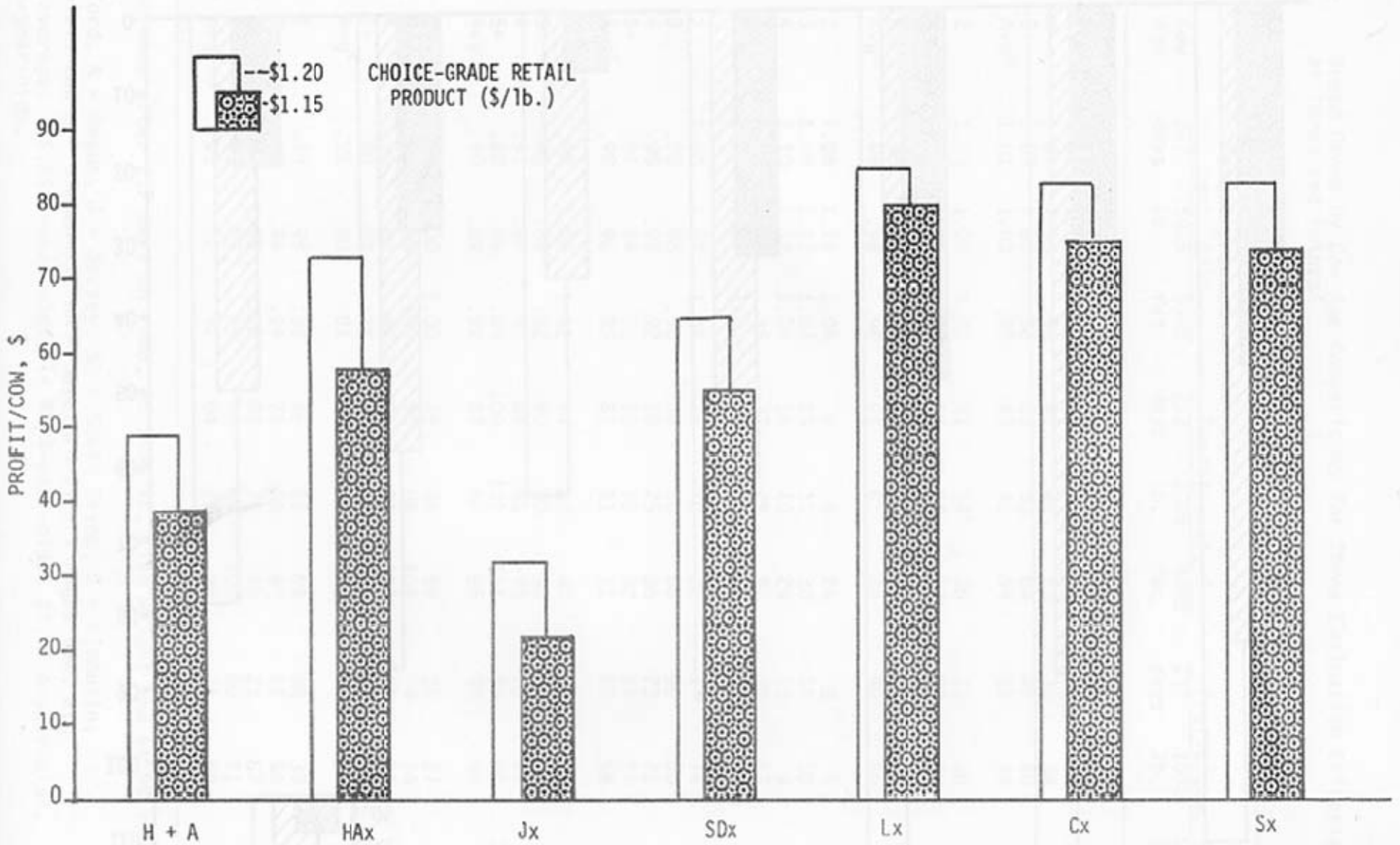

Figure 30.2. Profit per cow averaged over cow age at an age-constant end point for two values of choice-grade retail product. Retail product value of less than choice-grade equaled $1.07 per lb.